



The Governor's School of New Jersey

2012 GOVERNOR'S SCHOOL OF ENGINEERING AND TECHNOLOGY at Rutgers University

July 1st – July 27th, 2012

PROGRAM OVERVIEW

The Governor's School of Engineering and Technology is a unique and intensive residential summer program that brings together some of New Jersey's most talented and motivated high school students. At no cost to their families, students spend one month of the summer following their junior year studying on the campus of the Rutgers University School of Engineering. Through team-based courses in areas such as "Robot Soccer" and research projects ranging from designing water purification systems for the developing world to using "Wiimotes" for medical rehabilitation, students collaborate on cutting-edge topics. The scholars work with peers and professors who are both very smart and very enthusiastic about engineering and technology.

During the program, scholars collaborate with 2 - 4 other students on a novel research project and enroll in challenging engineering courses that cover material not normally seen in high schools, or even at the undergraduate level. Students' research projects culminate in a journal-style final paper and presentation in front of hundreds of invited guests at our research symposium. Students choose from elective courses designed to demonstrate both the core principles of engineering and contemporary problems in the field. In previous years students created and analyzed biodiesel fuel, designed and built wheelchair brakes for East African countries, and investigated the security and privacy of online social networks like Facebook. Research projects and classes are supplemented by site visits to local corporations, life-skills workshops, a series of distinguished guest speakers, and numerous activities that allow New Jersey's brightest and most enthusiastic young scholars to learn about opportunities in engineering and connect with professionals and peers from throughout New Jersey.

The Governor's School aims high. Scholars gain hands-on experience in research and work on challenging and open-ended problems with others who share their love for engineering and technology. Free of grades and official credit, Governor's School emphasizes current research trends and teamwork. The hands-on learning environment is unique, non-traditional, and inspirational. For many of our scholars, this is their first opportunity to collaborate with other students with the same academic talent and motivation. It's no surprise, then, that our alumni consider Governor's School to be not just an important educational foundation, but also one of the best experiences of their lives.

Throughout Governor's School, students are encouraged to take personal responsibility for their education and to develop their ideas; entrepreneurship is highly encouraged. Governor's Scholars can expect to be highly challenged and to work very hard. In return, they will reap the benefits of an environment in which discovery and the pursuit of knowledge are primary, but in which everyone has a lot of fun. Students can also expect to develop strong academic relationships with their research mentors at Rutgers, engineering professionals, and each other.

ELIGIBILITY

In order to be considered for the Governor's School of Engineering and Technology, a student must meet the following criteria:

- The student must be a New Jersey resident and be a high school junior during the 2011-2012 school year.
- The student must have a very strong interest in engineering and technology and be committed to the acquisition of knowledge and the pursuit of opportunities in that field.
- The student must be willing to live on campus for the duration of the program. Saturdays and Sundays make up part of the program; there will be no weekend leaves of absence.
- The applicant must be one of the top students in his or her school. The student should have primarily "A" grades in honors math and science classes and outstanding scores on standardized achievement tests. Students who have demonstrated very strong abilities in engineering outside the classroom can also be strong candidates for the Governor's School in spite of weaker standardized test scores. Competitive candidates often rank in the top 5% of their class.

The Governor's School encourages all qualified applicants regardless of sex, race, color, creed, national origin, physical handicap, political activity, or private conduct.

PROGRAM DESCRIPTION

Courses:

All students take five academic courses at the Governor's School of Engineering and Technology. Two of these courses will be considered part of our "core" and enroll all students in the program. Our *Robotics* course involves team-based competitions, culminating in "Robot Soccer" as the final challenge. *Modern Physics and Experimental Engineering* covers topics such as particle physics, relativity, string theory, and the engineering design of machines like the Large Hadron Collider.

Students also choose three elective courses from distinct categories- "Design Experience," "Laboratory Experience," and "Technical Analysis." Whereas the two core courses focus on topics that pervade engineering, the elective courses are designed to provide hands-on experiences in a particular discipline. The "Design" series of electives allows students to choose from topics like building a computer controlled room, engineering entrepreneurship, and computational techniques in biomedical engineering. The "Laboratory" series gives students the chance to do hands-on analysis and testing. For instance, classes in evaluating earthquake-resistant building designs, learning about biomedical signal processing techniques, and rapid prototyping an R/C car are typical "Laboratory" classes. The final category, "Technical Analysis," encompasses courses in applied mathematics and computer science/engineering. "Technical Analysis" courses range from using computer programming to solve difficult math problems to an intensive look at theoretical computer science, zero-knowledge proofs, and pseudorandomness. ***Please note that the elective classes vary from year to year; we have not yet chosen our 2012 courses.***

Research Projects:

The cornerstone of the Governor's School of Engineering and Technology experience is a small group research and design project, completed under the tutelage of an experienced research mentor from academia or industry. In groups of 3 - 5 students, the Governor's Scholars investigate and attempt to solve a complex and novel problem. Each group writes a conference-style research paper and presents its results at the Governor's School Research Symposium in front of an audience of professors, dignitaries, industry members, and invited guests. At the conclusion of the research experience, students should expect to have made significant connections with their research mentors and to have gained scientific maturity.

The project topics vary from year to year. Past projects have included creating the fuel map for an automotive engine, designing and building "smart" windows that adjust the blinds and lighting in a room based on sensor readings, and improving batch processes for mixing pharmaceutical ingredients. Many of these projects have tangible final products. For instance, one group from last summer's program wrote a reinforcement learning computer program that plays online games for them, while another group built a funnel system to improve the efficiency of urban wind turbines.

We highly recommend that you look through past students' research papers to get a sense of the Research Project experience. Research papers from the past four summers are available in our electronic research journal at <http://soe.rutgers.edu/gov-school-research-papers>

Site Visits:

Each Governor's School student will have the opportunity to visit three local corporations to learn about future career opportunities. Among the dozen locations we visited in the past were PSEG Nuclear, Sun Microsystems, Chanel, Lockheed Martin, and the new Meadowlands Stadium. Site visit destinations vary from year to year.

Enrichment Series:

A number of supplementary activities will introduce possible career paths in engineering. "Life Skills Days" will provide exposure to important skills an engineer needs to know, yet may not have seen before. Each Life Skills Crash-Course provides a 60 minute introduction to a topic without assuming any prior knowledge. Past topics have ranged from using power tools, repairing iPods, changing a car's oil, and speed-solving the Rubik's Cube. We've even offered workshops on salsa dancing!

A series of distinguished guest speakers will discuss cutting edge research results and career opportunities, giving advice that will prove relevant throughout scholars' careers. Past guest speakers have included vice presidents at major corporations, founders of startup companies, quantum computer experts, civil engineers redesigning local roadways, biomedical engineers who went on to medical school, science fair champions, and professors leading infrastructural changes in Africa.

Additional activities at Governor's School include a College Question and Answer session with current students at elite universities, a half-day simulation of the team design process, recreational athletics activities, outreach programs that introduce engineering to middle school students in disadvantaged communities, and a student talent show! We customize our annual activities based on the interests of admitted students.

THE SELECTION PROCESS

To apply for a New Jersey Governor's School program, a student must be nominated by his or her high school's nominating committee. If the high school's junior class contains at most 325 students, only one student may be nominated for each Governor's School program. If the high school's junior class has between 326 and 650 students, two students may be nominated for each Governor's School program. Three students may be nominated only if the junior class comprises of more than 650 students.

Students chosen by their high school's nominating committee are termed "nominees." The nominee is responsible for completing all parts of the application, ensuring that all necessary supplements (including transcripts, copies of PSAT scores, and the principal's signature) are in order, and verifying that the application has been submitted before the deadline. Applications must be sent **directly to Rutgers University** by the high school (not the applicant) at the following address. **Applications must be postmarked on or before January 13th, 2012.**

NJ Governor's School of Engineering and Technology
Rutgers University School of Engineering
98 Brett Rd., Room B-110
Piscataway, NJ 08854

The Governor's School will confirm receipt of the application by late February in an email to the applicant. Please note that incomplete applications (missing any required document) will not receive full consideration. At Rutgers, a panel of professors, researchers, and educators will review nominees' applications. Using the criteria below, this panel chooses the "Governor's Scholars" and invites those students to attend the Governor's School. **The committee's decision will be emailed to the student after school hours on April 5th, 2012.** The admissions process is very competitive; in recent years, 15% - 25% of nominees have been offered admission.

SELECTION CRITERIA

The selection committee for the Governor's School of Engineering and Technology aims to craft a student body made up of New Jersey's most talented and enthusiastic students. Our student body should be diverse in myriad ways. Our students should possess a great range of gifts in technology, the arts, humanities, and the sciences. Overall, the committee chooses the students who will best take advantage of the opportunities presented by the Governor's School.

Decisions are based on the following qualitative and quantitative criteria:

- The student's high school transcript and class rank, which should demonstrate that the student is at or near the top of his or her class.
- The student's essays and reasons for wanting to attend the Governor's School
- Letters of recommendation
- The student's extracurricular activities and community service pursuits
- The student's academic and extracurricular honors and accomplishments
- The student's standardized test scores (PSAT preferred)

We expect Governor's Scholars to exhibit great creativity and a unique passion for the nature of our Governor's School. We look for students who have shown a strong interest in engineering, technology, science, and mathematics, as well as an open mind and the ability to work on a team to explore these interests further. We want to know what a student hopes to gain from the Governor's School experience, as well as what he or she hopes to contribute to the program. In general, students who have demonstrated a fervent interest in engineering and technology both inside and outside of the classroom will be most successful in the admissions process. A student with perfect standardized test scores but only superficial interest in the nature of the school is not a competitive candidate. Of course, our scholars are not only devoted to engineering and technology, but *also* have outstanding test scores and rank at the absolute top of their class. We are privileged to choose the best of the best.

CONTACT INFORMATION

Dr. Ilene Rosen, Program Director
Jean Patrick Antoine, Program Coordinator

Web: <http://soe.rutgers.edu/gset> (Engineering only)
<http://www.nj.gov/govschool/> (all programs)

Email: j.antoine@rutgers.edu

Postal Mail: Governor's School of Engineering and Technology
Rutgers Engineering Office of Student Development
98 Brett Rd., Room B-110
Piscataway, NJ 08854

Telephone: (732)445-2687, Extension 16

Fax: (732)445-5878

APPLICATION INSTRUCTIONS

Step 1: Review the program information and descriptions in this packet. We also highly recommend that you and your family visit our web site at <http://soe.rutgers.edu/gset> in order to see pictures and videos from past years, along with past students' research papers.

Step 2: Complete the "Cover Sheet" page, which is the fifth page of this packet. Complete the online Student Application Data and attach to the Cover Sheet. This "Cover Sheet" should be the first page of your submitted application.

Step 3: As the second page of your application, include the "Check List," which is the sixth page of this packet. Portions of this check list must be completed by your school principal.

Step 4: Attach a list of your extracurricular activities, in order of their importance to you. You are welcome to include clubs at school, community service activities, artistic or athletic programs, jobs you've held, individual pursuits, and anything else that you do. Be sure to include leadership roles you hold in any of these activities. Along with this list, please note any honors (academic or extracurricular) that you have received.

Step 5: Include answers to each of the following essay prompts. We recommend writing about 1 page, single spaced, for each essay question. The short responses can be answered in about 2 paragraphs each.

Essay 1) Create an autobiographical sketch of your background, history, interests, and ambitions. Be sure to describe what makes you unique.

Essay 2) Why would you like to attend the Governor's School of Engineering and Technology? What do you hope to gain from and contribute to the program? Be sure to tell us about your interests in engineering and technology, how they've developed, and any steps you've taken to explore these disciplines.

Short Response 1) Tell us about your most meaningful extracurricular activity or interest.

Short Response 2) Discuss an idea in engineering, technology, science or math that you find fascinating. Why does it intrigue you? You can choose a topic as general as a whole discipline or as specific as a particular problem, challenge, or invention.

Short Response 3) Propose a specific engineering or technology problem you'd like to be working on ten years from now. Why is the problem interesting, and how do you hope to approach it?

Step 6: Include recommendation letters from two people not related to you. At least one of these letters must come from a high school teacher. The second letter may come from another teacher, a club advisor, or a mentor.

Step 7: Verify that your high school will include your official transcript (including junior year grades) and official 2011 PSAT scores. If you did not take the PSAT in 2011, include your 2010 scores. You may also include your SAT scores. If you have not taken the PSAT or SAT, be sure your principal indicates this on his or her checklist.

Step 8: If your junior year grades or junior year PSAT scores are not available at the time you submit your application, please forward them to the selection committee at Rutgers once they become available.

Step 9: Once your application is complete, it is your responsibility to verify that the application has been mailed to Rutgers University by the January 13th, 2012 deadline.

DATES TO REMEMBER

By **January 13th, 2012**, completed applications must be mailed by the high school and submitted directly to Rutgers University. This is a postmarked date.

By **late February, 2012**, you will receive an email confirming the receipt of your application.

On **April 5th, 2012**, you will receive an email announcing the selection committee's decision.

From **July 1st to July 27th, 2012**, the Governor's School will be in session on the campus of Rutgers University.



The Governor's School of New Jersey

2012 GOVERNOR'S SCHOOL OF ENGINEERING AND TECHNOLOGY at Rutgers University

Application Cover Sheet

Student Name (PRINT): _____

Student Email (PRINT): _____

School Name (PRINT): _____

Please visit the Governor's School of Engineering and Technology web site at:

<http://soe.rutgers.edu/gset/2012application>

Follow the link to the 2012 General Application Information Sheet form:

1. Complete and submit this form.
2. Be sure to print the confirmation screen after submitting the form.
3. Attach the printed document to this application.

Note: Applications missing the Online General Application Information Sheet will not be processed.

IMPORTANT DATES

January 13th, 2012

Applications postmarked.

April 5th, 2012

Admissions decisions are announced by email.

July 1st - July 27th, 2012

The Governor's School of Engineering and Technology is in session.

STUDENT AND PARENT CERTIFICATION

___ I am a resident of New Jersey.

___ I expect to be a high school senior in the 2012-2013 school year.

___ I am willing and able to attend the entire Governor's School session.

Signature of Student

Date

This is to certify that I give my permission for the student named above to participate in the Governor's School of Engineering and Technology at Rutgers University, in full-time residence.

APPLICATION CHECK LIST

(Please include as "Page 2" of your application)

Nominee's Checklist:

- ☐ I've included the "Cover Sheet" as Page 1 of my application.
- ☐ I've included this checklist as Page 2 of my application.
- ☐ I've attached a list of my extracurricular activities and my extracurricular and academic honors.
- ☐ I've included responses to all requested essay prompts as per the guidelines on Page 4.
- ☐ I've attached two letters of recommendation as per the guidelines on Page 4.
- ☐ My school has included my official high school transcript and copies of my PSAT (or other standardized test) scores.
- ☐ I am a resident of the state of New Jersey and will complete my junior year of high school in June 2012.
- ☐ I have kept a copy of my application for my own records. If my current PSAT scores or transcript were not included, I will forward them to Rutgers University once they become available.

I have reviewed the checklist above, and have included all necessary and appropriate application materials. All of the information submitted as part of my application is factual and truthful to the best of my knowledge.

Name of Nominee (please print)

Student's Signature

Principal's Checklist:

- ☐ The nominee is one of our top students and has expressed a strong interest in the Governor's School of Engineering and Technology.
- ☐ Our school has nominated the correct number of students. (If the junior class has 1 – 325 students, 1 nominee is permitted for each Governor's School program. If there are 326 – 650 students, 2 nominees are permitted for each Governor's School program. If there are more than 650 juniors, 3 nominees are permitted for each Governor's School program.)
- ☐ The nominee has included his or her application "Cover Sheet," this checklist, a list of activities and honors, essay responses, and two letters of recommendation.
- ☐ I have included the nominee's high school transcript and copies of his or her PSAT (or other standardized test) scores.
 - ☐ The transcript includes grades from the first marking period of the 2011-2012 school year.
 - ☐ The student will forward his or her junior year grades to the Governor's School once they become available.
 - ☐ I have included the student's 2011 PSAT scores. (Preferred)
 - ☐ The student did not take the PSAT in 2011. I have included his/her 2010 PSAT scores.
 - ☐ I have included the student's SAT scores.
 - ☐ No PSAT / SAT scores are available for this student.
- ☐ The nominee is a conscientious and eager student, and ranks near the top of his/her class.

Nominee's high school GPA _____ **Number of Students in Junior Class** _____ **Nominee's Class Rank** _____

- ☐ The nominee's standardized test scores are among the best in our school.

PSAT Scores: Verbal Math Writing **Test Date:** 2010 / 2011 (circle)

- ☐ This student has not been nominated to more than one Governor's School.
- ☐ The nominating high school has kept a copy of this application on file.
- ☐ (Governor's School of Engineering and Technology only) The student has included answers to the three short response questions. At least one letter of recommendation is from a high school teacher; the other may be from another teacher, mentor, or advisor.

I have reviewed the checklist above, and have included all necessary and appropriate application materials. All of the information submitted as part of this application is factual and truthful to the best of my knowledge.

Name of Principal (please print)

Principal's Signature